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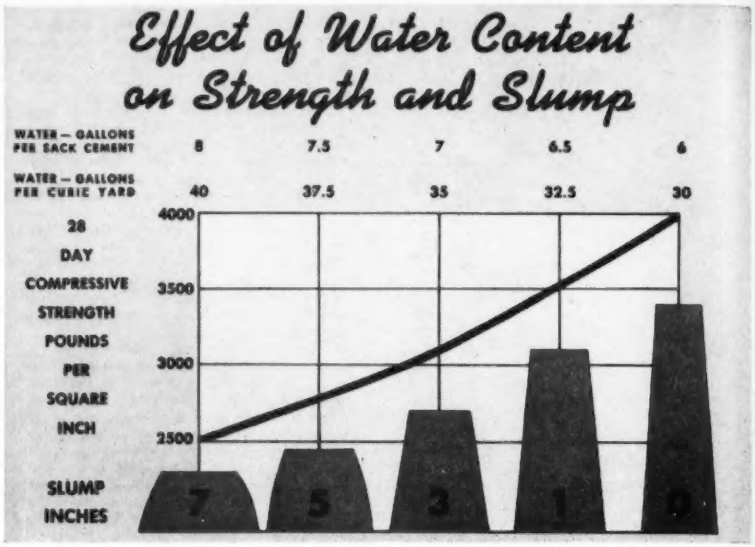
concrete construction

ARTICLES



Graph courtesy of National Ready Mixed Concrete Association

ARE YOU PLACING OR POURING?

Almost any knowledgeable person in the field of concrete construction would agree that one of the industry's serious problems is the volume of concrete which is still being "poured" instead of "placed." The difference isn't as hair splitting as you might suppose.

The idea of pouring concrete got its start in the days before anyone understood the real function of water in the production of concrete. From a strictly chemical point of view the most important function of water in concrete is to react with the cement in order to form the paste which makes the aggregates stick together.

How much water does it take to do this? Only about three gallons to a sack of cement. However, water serves another important function by making it possible to place and finish concrete with a reasonable amount of effort, and unfortunately this creates a need for more than the optimum three gallons per sack which would suffice for chemical purposes.

But even this requirement, plus some allowance for losses due to bleeding and evaporation, can usually be met with a total water content of around 6½ gallons per sack. A mix with this water content should produce 3500 psi concrete. When you add more water to produce a concrete which doesn't require placing but can literally be poured, you throw away strength just as surely as though you cut back on the cement content.

The accompanying graph, reproduced here through the courtesy of the National Ready Mixed Concrete Association, shows how slump increases and strength declines with added water. Six gallons of water per sack should produce zero slump concrete having a strength of around 4000 psi. The addition of just two more gallons per sack, or ten more gallons per cubic yard, can drop the strength to about 2500 psi —a loss of 37 percent!

So it's worth a good deal to everybody concerned with quality concrete construction to not only be aware of the distinction between "placing" and "pouring," but to be willing to perform the small amount of additional work required to handle and finish the drier concrete demanded by considerations of both quality and economy. This is an area in which a very little effort will pay off handsomely.

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FABRIC MATS SAVE TIME IN FLAT PLATE SLAB

WHAT IS BELIEVED to be the first use of heavy welded wire fabric mats for reinforcement of flat plate structural concrete floor slabs has scored significant savings in construction time and costs on a New York apartment building. The flat plate floor system, itself a relatively new design concept, was used for a 12-story and penthouse reinforced concrete luxury apartment.

The dual decision (to employ flat plate concrete slabs, and to reinforce them with heavy fabric rather than conventional bars) stemmed from the insistence on obtaining the greatest possible rentable cubic space at lowest cost, and the most efficient structural design, with speedy erection. The thin (5½-inch) flat plate slab with its smooth surface, top and bottom, unbroken by offsets for beams and girders (except for spandrels around the perimeter) met the first condition by offering more ceiling height for a given building height. Another advantage: its smooth underside without offsets and jogs permits flexibility of partitioning and cuts plastering and decorating costs.

Seeking to answer the second condition (most efficient structural design), the owner commissioned his consulting engineers (Farkas and Barron, New York) to space columns to achieve the most efficient structural flat plate design possible, and then turned over to his architects (Boak & Raad, New York) the problem of fitting apartments to the column spacing.

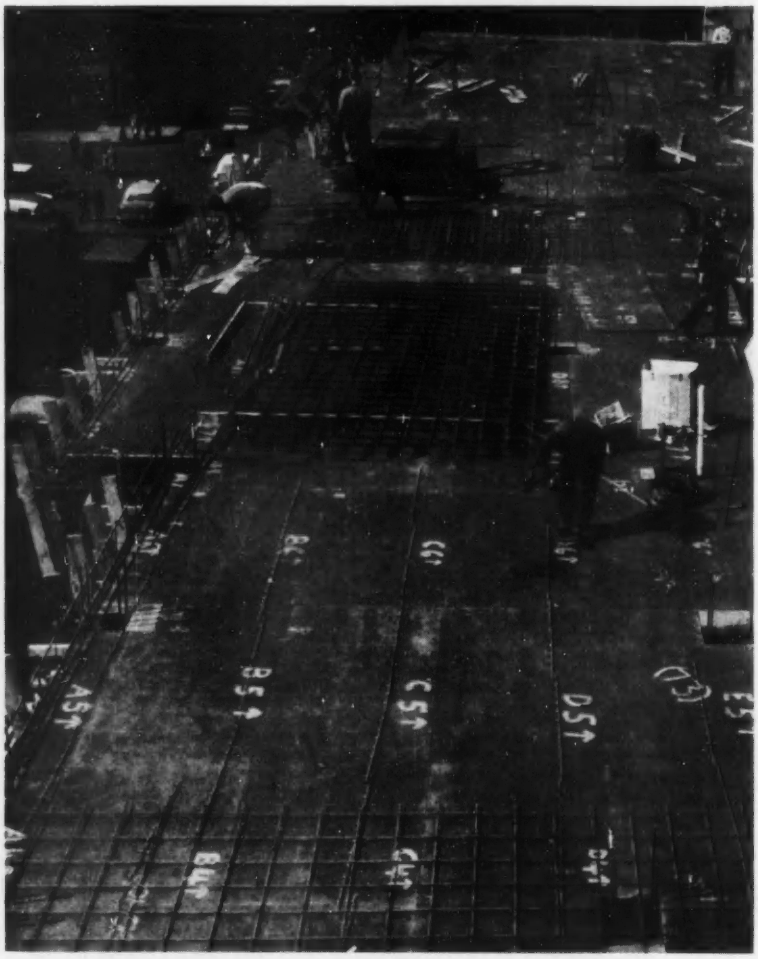
With a structural design completed and accepted, a contract was let to the Dic Concrete Corporation (Elmont, Long Island) covering conventional bar reinforcing and concrete work for the flat plate slabs and columns. But some doubt remained with owner and engineers that the floor system being used would result in speedy erection.

At this point, consultant Maurice Barron, himself a pioneer in achieving better, less costly ways to build, suggested the use of mats of heavy welded wire fabric for reinforcement of the slabs. His arguments: reduction in amount of steel and weight per square foot through use of 24,000 psi design steel stress permitted by fabric's guaranteed yield strength of 56,000 psi; and reduction in time and cost of handling of mats (many 10 to 20 feet) as opposed to placing and tying of individual reinforcing bars.

The owners then went to work with the contractor to plan this new departure in flat plate floor construction.

Mats of welded wire fabric for next floor of flat plate slab apartment building stockpiled in pre-arranged order. Mats (some 10 by 20 feet) were trucked to the job a floor at a time and scheduled to arrive in early morning before heavy traffic. In background, transit mix truck waits to discharge into a crane-hoisted hopper.

After plywood deck forms are secured in place, lather places ¾-inch high chairs (see enlargement at right) which will support bottom layer of welded wire fabric. Spandrel steel at the left (below) has been placed and bar reinforcing cages have been dropped in forms for columns. Note painted identification code on each panel of plywood. Panels are reusable, and fall into same relative position on each floor.



Farkas and Barron, meanwhile, took the design before city building authorities and received approval for this first use of fabric in flat plate slabs.

As promised, Barron's design resulted in reduction of poundage of steel, from 5.2 pounds per square foot for conventional reinforcing to 3.8 pounds for fabric. The design specified 19 different combinations of welded wire fabric styles (wire spacing, gage and mat size) for nearly 120,000 square feet of floor, with the styles being repeated over and over from floor to floor. Some of the mats, particularly those placed over the top of columns to resist negative moment, were of 60-gage wire, nearly half an inch in diameter.

To assure effective continuity of reinforcement when using fabric, the usual practice is to lap the mats at least one wire spacing. On this job, however, an unusual ladderlike strip of fabric was used which nested over the adjacent mats, bridging the gap between them.

With the start of actual flat plate floor construction on East 53rd Street early this year, proof of the time and labor saving potential of heavy fabric reinforcing mats now fell to the contractor.

A two-working-day cycle proved perfectly feasible for the complete erection of one floor (140 by 60 feet) and its supporting reinforced concrete columns. The lower floors, however, were built under severe winter time conditions and a 2½- to 3-day cycle was adopted as being more practical. (The upper floors generally were completed in 2 days). It is believed that conventionally reinforced construction of an equivalent area would have taken up to 4 days, and required more lathers to place the steel.

After some experimentation on the first floor, here is how the operations sequence was worked out:

First day: (1) Form columns, frame for deck forms, and place decking; **(2)** drop reinforcing cages for columns and spandrel beams; **(3)** place ¾-inch high chairs for supporting fabric mats away from deck forms; **(4)** place mats of heavy wire fabric on chairs for bottom steel (generally positive moment reinforcement between columns) and tie; **(5)** cut out fabric for ducts, boxes, sleeves and conduits; **(6)** start placement of boxes, sleeves, etc.; **(7)** start wiring conduits and pipe trades.

Second day: (8) start placing fabric mats for top steel, supporting on 4-inch high chairs; **(9)** complete conduits and placing and tying on chairs of top fabric; **(10)** place dual concrete hopper, runways and tarpaulins to close in floor below, in preparation to pour.

Third day: (11) pour and finish flat plate slab. (In warmer weather, with concrete setting up rapidly, placing was done on the second day).

Much of the know-how behind the contractor's fast work resulted from experience gained in constructing the first floor. For example, originally the sleeves, boxes, vents, etc., were placed on the bare plywood deck and then mats of fabric placed on top. This greatly slowed steel placement, since the lathers had to stop to fit each mat around the obstructions, and cut away wires where necessary.

This problem was solved by painting an identification number on each panel of plywood decking and using it in the same place for each of the twelve floors. On this panel were painted markings showing where each box, vent, sleeve, or other break in the slab would be. With these permanent markings in place, the lathers were able to place the mats in position with no loss of time, and later come back with bolt-cutters and cut out the openings as indicated on the forms.

Three sets of forms were used on the job, each marked identically, and requiring only verification of markings by the job engineer as each floor was formed.

Another speed-up resulting from first floor experience concerned placement of the ¾-inch chairs. Originally, the mats were placed and then the chairs slipped under afterward. But when lathers became familiar with the placement of each type of mat they were able on subsequent floors to place the chairs first, in the proper position, and thus save rehandling the mat.

While the step-by-step sequence was followed on top, other work was going on below on completed floors. The lathers, while not actually placing fabric mats or column steel, were making up cages of bars for the columns and spandrels. Other workers started up space heaters which kept above freezing the air temperature of the tarpaulin-enclosed floor space below the newly placed concrete.

After at least seventy-two hours, the forms were stripped from the floor and columns, cleaned, re-oiled, and prepared for their next crane trip to an upper floor. Meanwhile, another worker, using a concrete grinder, was knocking off any minor bumps and seam ridges (to a 3/16-inch tolerance) on the under, or ceiling, side of the flat plate slab, in preparation for later plastering and painting.

Transit Mix Corporation of New York furnished the Lelite concrete, which had to meet a specification of 3,500 psi strength in 28 days. Each deck required about 240 cubic yards of concrete which took about 5½ hours to place. Motorized buggies were employed to speed delivery of the concrete from crane-fed hopper to deck. The owner believes that the time savings resulting from good planning and tight organization, plus those directly attributable to the use of heavy fabric in the flat plat slab structure, accounted for a reduction of 15 working days on the project. END

Readers who would like to have additional information on the subject discussed in the foregoing article may request it by mailing in one of the reader service forms in the back of this issue.

Operator dumps half-yard hopper of motorized buggy on upper floor of project. Fabric mats, although easily handled and placed, also provide sufficient rigidity to permit workers to walk about freely without displacing reinforcing.

Operator uses electrically driven "giraffe" to smooth bumps and ridges to a 3/16-inch tolerance from underside of flat plate slab. Plastering goes over concrete underside of 5½-inch thick slab. Use of flat plate slab gives greater ceiling height for given building height, gives flexibility of partitioning, and cuts cost of plastering and decorating due to absence of offsets and jogs.

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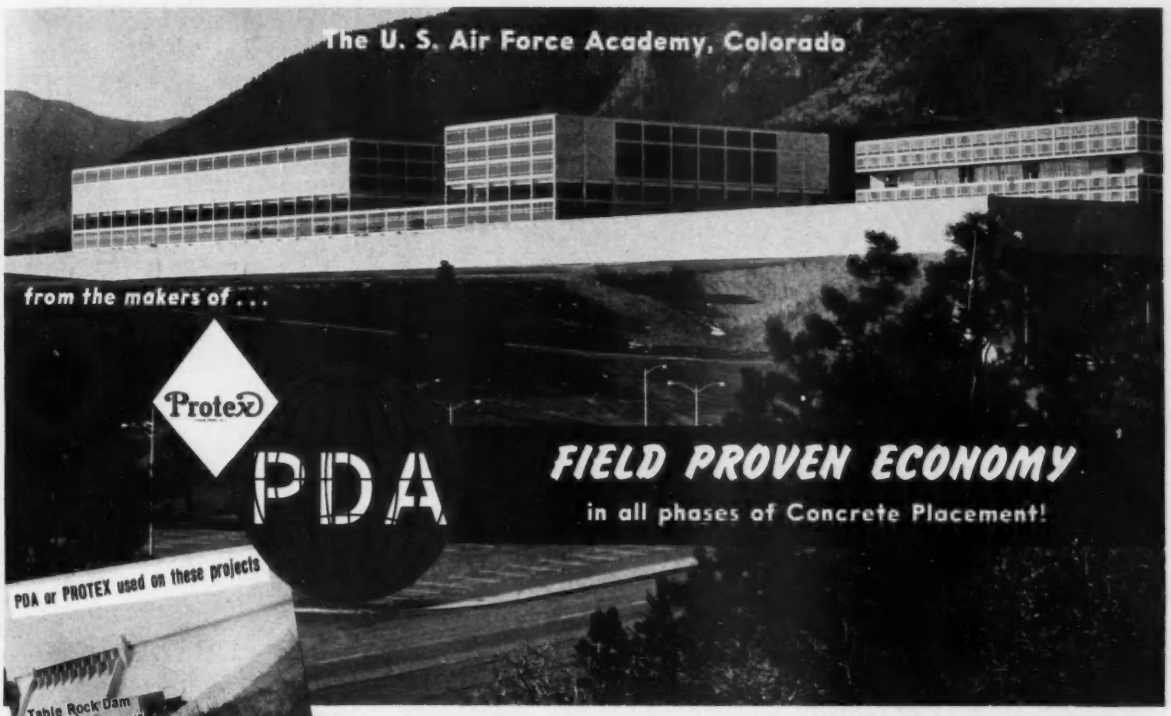

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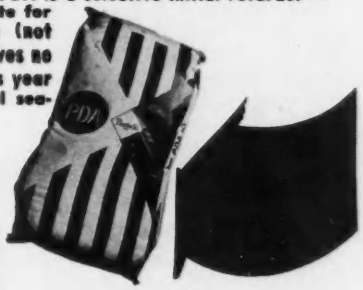

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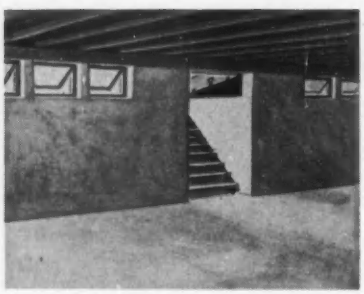


The full basement can be made a highly salable feature of a new home—from the finished concrete work to partitioned areas for work, play, and storage to the final decorating for attractive and comfortable living.

THE DAYS OF THE DAMP, dark cellar are over. But not every prospective home buyer knows this. It therefore becomes one of the first jobs of the builder or architect to sell the buyer on the advantages of a full basement. These advantages, summed up in a single statement, are that the basement provides added usable living space at a lower cost per square foot than any added space that can be built above ground.

If the basement simply provided extra space, this in itself would be an advantage. For few slab-built homes today offer the owner adequate room for storage, work areas, and spreading out in the pursuit of leisure-time interests. The shortened work week has put a premium on increased space in the home that makes it possible for individual family members to develop constructive hobbies to fill the newly found free hours. Like the "thinking man" series of the Viceroy cigarette ads, many people today are engaging in an infinite variety of unusual leisure-time activities that require space, such as photography with its dark-room equipment, gun or sword collecting, or raising plants in their own greenhouses.

To fill today's needs, the modern basement must be a lot more than added empty space under the house. Properly ventilated and lighted, it can be a hobby center or a pleasant workshop. It can be a cheerful extra living room or guest room with a fireplace of its own, or a play area with a swimming pool of its own.

Added to the advantages of this extra usable space is that of extremely low cost. The full basement adds much to the size of a house while it adds only one-tenth to the cost. To cite specific figures, the buyer can get more living space below the house at $1 to $2 a square foot as compared with a cost of $10 to $15 per square foot for added space upstairs.

As if all this were not convincing enough, there are a few age-old advantages to the full basement that you would do well to keep in mind when discussing the question with home buyers. The basement is a comfortable place of retreat—warm in winter and cool in summer. It is the most logical and convenient place in any home for the location of heating units and plumbing. It insulates the ground floor against cold, dampness, and termites. Since it is set deep, it offers a house a steady foundation.

Once the home buyer is sold on the desirability of the full basement, you, as the builder or architect, can take it as far toward completion as the buyer wishes. This may mean carrying out the finishing work yourself, supplying both ideas and materials from your own resources. Or it may mean simply constructing the concrete walls and basement floor, leaving it to the owner to add the finishing touches. However, even where you leave it to the owner to do the finishing, it can be very helpful (and give added sales appeal to the basement) to suggest where he may obtain the materials he will need.

Whether or not you do the finishing work, there are three stages in building a home with a basement that you will nevertheless want to take into consideration. The first is preplanning the construction of the base-

ment in the over-all plans for the house. The second is following sound concreting practices in erecting thick, solid walls and floors that will keep moisture out and warmth in. The third is suggesting, or actually providing, inexpensive design details to turn the basement into usable extra space.

pre-planning the basement

Pre-planning a basement along with the construction of a house means taking the following things into consideration. The first is site. It is more difficult to construct a basement on a hillside lot than on flat or rolling land. The reason is that on hilly land concrete forms must be heavily braced and more effort is required in getting around the foundation to pour.

The second step in pre-planning is to allocate space for plumbing and heating units in one corner of the basement, leaving most of the area free for usable living.

Third, build for adequate light and ventilation. The easiest and least expensive way to make more natural light available to the basement area is to include more windows in the basement walls—grouped close together in a series or "ribbon" effect. Supporting the house above these windows presents a problem no greater than supporting the second floor of any house—2 inch by 8 inch or 2 inch by 10 inch vertical supports can be placed between windows to pick up the first floor plate around the house.

Basement windows should be carefully placed to catch summer breezes. They should be adjustable and fitted with interior screens to provide a lighter and cooler basement in summer.

Fourth, provide adequate wiring, fixtures, and electrical outlets for expandable living space.

Fifth, provide for a direct exit to the outside. A steel hatchway fills the bill here very well—allowing for direct traffic in and out of the basement and for lugging heavy or large articles for storage into the basement area. Easy access to the basement actually provides a house with a "clean-up" area, which is especially important for use by children before they enter the main floor of the house. It also provides for a convenient flow of indoor-outdoor traffic: from garage to workshop or from barbecue to recreation room.

An attractive, safe, and relatively inexpensive stairway can be made with steel stringers, wood treads, and colorful plastic risers. By placing indirect lighting behind the risers, the home owner can greatly enhance the beauty and safety of his basement stairway.

Sixth, put aside any odd leftover pieces of construction material, such as wood paneling, that might make attractive and yet inexpensive thin-wall partitions or hanging ceilings.

concreting the basement

The only way to get a dry, comfortable cast-in-place basement is to follow the fundamental practices for good concrete workmanship. Begin by placing footings for the basement walls on firm soil below the frost line. Next, pay special attention to wall forms. Sturdy prefab forms will insure finished walls that will be straight and accurate. Moreover, they are economical in that they can be reused, and are lightweight for easy stripping.

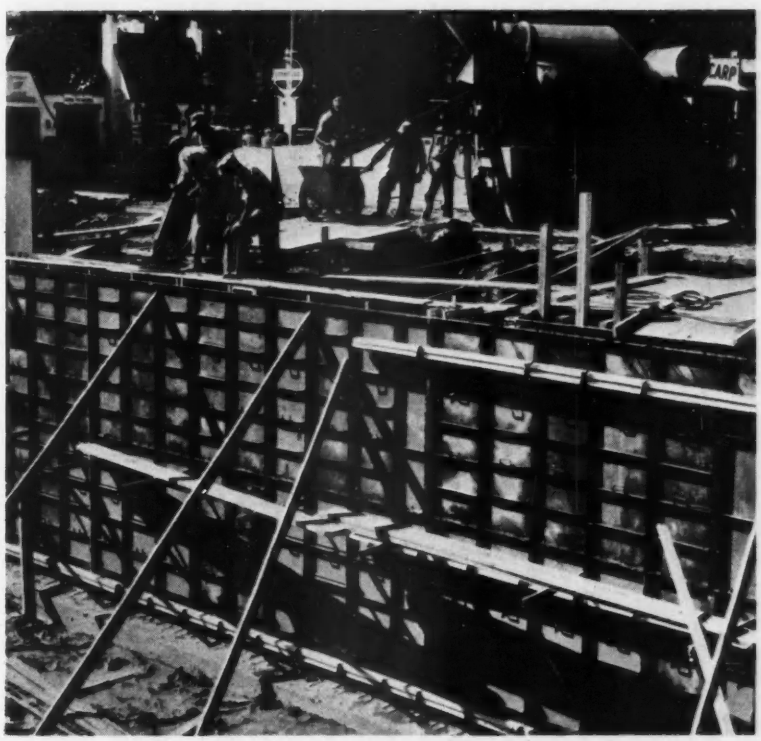
The quality of the concrete mix for basement use is important, for it should give maximum strength and watertightness. As in all concrete work, the addition of extra water should be avoided at all costs, for it may result in shrinkage and cracks that, in turn, will mean a leaky basement.

Ready-mix trucks should deliver the concrete at a number of points around the form to avoid chuting over long distances. If this is impossible, concrete conveyors or power buggies should be put into use. The proper placing of concrete prevents segregation, another source of possible leaks. The concrete should be placed in even layers that are not more than 12 inches deep, and vibrated sufficiently to settle it against the forms and avoid possible honeycoming.

The curing stage, as always, is important, since the ultimate strength that poured concrete will attain depends so much upon its being permitted to dry and harden slowly, retaining some of its moisture throughout the process. This usually means allowing one or two days in summer, and four to seven days in cold weather.

Good finishing where a smooth surface is desired means removing any form marks and then painting the out-

Here ready-mix is being used in concreting a basement foundation formed with modern prefab panels. Since the truck was unable to get close to the forms, buggies are being used to move the concrete.



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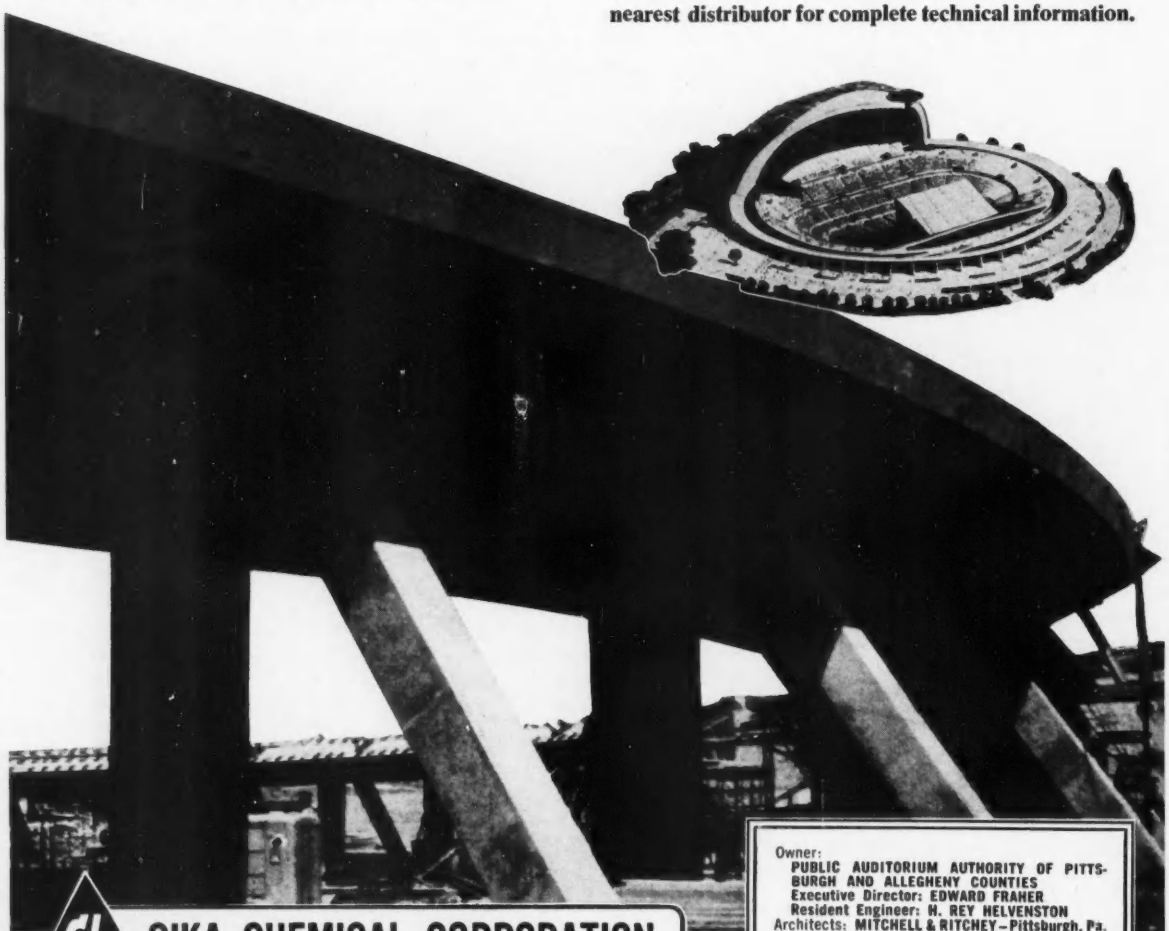

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TWENTY QUESTIONS

that can help give the answer to a quality concrete job.

For contractors and their supervisors: Use this check list during construction of your next job. It will help minimize costly errors and prevent troublesome problems caused by neglect and oversight.

Check list courtesy of The Concrete Construction Council of Mahoning Valley, Youngstown, Ohio.

1	☐	Has the foundation area been cleared of vegetation, top soil, mud and other debris?
2	☐	Has the foundation material been tamped and wetted?
3	☐	Have the forms been set to proper alignment, grade and shape and has specified reinforcing been properly placed?
4	☐	Have the forms been oiled to prevent adhering to the concrete?
5	☐	Have the weather conditions been checked regarding the possibility of rain? Will the predicted temperature range be satisfactory for placing and finishing? This should be determined before the concrete is ordered.
6	☐	Has the concrete arrived too wet or too dry?
7	☐	Did the contractor add unnecessary water to the mix?
8	☐	Does the concrete run freely when placed? It should **NOT.** This indicates that excessive water has been added.
9	☐	Is the concrete being properly compacted, vibrated or spaded into place?
10	☐	Is the concrete being leveled to the proper grade?
11	☐	Are the workmen's shoes free from mud when they must walk in the fresh concrete?
12	☐	Is the concrete being allowed to harden slightly before the finishing is begun? Is the concrete being finished too soon? This will cause excessive water to be drawn to the surface, later causing dusting, scaling or crazing.
13	☐	Has the surface been finished to a true and uniform grade such that it will drain itself?
14	☐	Is the type of curing which was previously agreed upon being performed?
15	☐	Is the concrete being protected from the elements? .
16	☐	Have forms been left in place until the concrete has set?
17	☐	If the concrete may be subjected to heavy loads during the first 2 or 3 weeks, has the area been barricaded?
18	☐	Is earth backfill being placed along all exposed edges of the concrete as the forms are removed?
19	☐	Now that construction has been completed has the work area been properly graded and cleaned of debris?
20	☐	Does the completed job present a pleasing appearance? Something may be wrong and look right, but it can never be right if it looks wrong.

Photos courtesy of Cement and Concrete Association, London, England.

LEFT: The plaster mold for this fascinatingly aggressive crow was made in 6 pieces. The surface of the concrete was polished with graphite to obtain the desired sheen.

OPPOSITE PAGE: The rich black surface for this portrait was obtained by polishing the concrete with ordinary grate polish.

CONCRETE . . . THE ACCOMMODATING MATERIAL

The natural grey of concrete was ideally suited to this prim figure. The 20-inch high statuette has a coarse-textured surface.

ONE OF THE MANY FASCINATING ATTRIBUTES OF CONCRETE is its astonishing adaptability to a seemingly unlimited range of purposes—from the construction of dams, involving the use of millions of cubic yards, to intricate sculptures requiring only a few pounds. The illustrations on this page show a few of some 26 pieces of concrete sculpture which were on display at the Royal Academy Summer Exhibition in London last year.

The textures and effects shown were obtained by casting techniques not entirely unlike those which are being employed on an increasing number of construction projects, where it is desired that concrete fulfill the double functions of load carrying and providing attractive finished surfaces. Indeed, we are informed that sculptors show a preference these days for casting their work in concrete for pretty much the same reasons that architects and builders prefer it for their more utilitarian purposes: the ease and convenience with which it can be worked, its rugged vitality, the astonishing range of colors and textures which can be achieved with minimum effort, its permanence and, finally, the extraordinary economy which is an inherent characteristic of all concrete work.

Concrete is not only used as a casting medium, for some artists prefer to make rough castings in concrete and do the finished sculpturing by hand. Some even elect to start out with a solid block of concrete, carving it as if it were stone to expose the coarse aggregate.

The interesting examples pictured here all represent the use of concrete as a casting material. The steps used generally involve the making of an original model in clay, which is subsequently used for the casting of a plaster mold in as

Sculptors like concrete for many of the same reasons that are leading to its increasing use in every conceivable type of building construction.

many pieces as may be required. It is in this mold that the concrete is cast, either solid or hollow, depending on the size of the subject.

As in structural work, great emphasis is placed upon the use of a mix which is as dry as possible, consistent with the need for thorough compaction. In the case of small members, such as legs and arms in a small scale work where the concrete must be packed around reinforcement in a very small space, somewhat wetter mixes are necessary. Thorough and careful compaction are regarded as essential, to the end that when all the work is properly done it is literally possible to reproduce even a finger print.

There are a number of ways of achieving color. For many subjects the natural bloom with which the cast emerges from the mold gives a much-to-be desired patina to the finished work. Oils, special washes, the use of colored aggregates, and imaginative employment of various waxes and dye powders make the possibilities literally unlimited.

As one enterprising young sculptor has pointed out: "Concrete is a most accommodating material which accepts unperturbed an astonishing variety of unconventional treatments." On the captions accompanying the illustrations we have tried to indicate briefly something concerning the techniques used for each piece. Whether or not the methods are adaptable to the construction projects which are the immediate concern of this magazine, we believe our readers will experience a pardonable glow of pride that the material which their industry has used and developed for so many years should be so completely at home in the hands of other gifted artists. END

ALPHA
BETTER CONSTRUCTION THROUGH BETTER USE OF CEMENTS
news and notes from the field

CRACKS IN CONCRETE: *why they occur—how to control them*

Cracking is one of the most misunderstood problems in concreting, and is generally regarded as a sign of defective concrete. On the contrary, most cracking is the result of improper construction practices and can be controlled by simple precautions.

Like other construction materials, concrete contracts and expands under various conditions of moisture and/or temperature. This normal movement should be anticipated and provision made for it in the design, placement and curing of concrete, otherwise cracks may result.

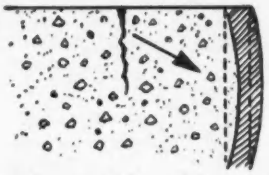
Generally, most cracking is caused by stresses exerted in or on new concrete while it is still "green"—before it has gained sufficient strength to resist such forces. A majority of cracks occur during the first few days after concrete is placed. As a rule, most cracks result from:

• Shifting of concrete before it hardens • Shrinkage and expansion of concrete before and after hardening.

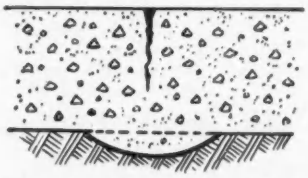
Shifting Before Hardening

This condition can cause cracks that are extremely difficult to diagnose. See Figures A, B and C. These cracks are caused by forces resulting from improper construction practices such as:

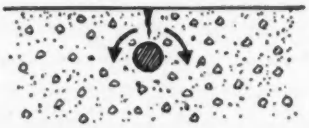
• Unstable forms • Unstable subgrade (uncompacted, frozen, muddy) • Subbase paper rupturing on uneven subgrade • Jarring of unstable ground • Improper placement of reinforcement (too close to surface).



A Bulging or shifting of forms due to timber expansion, loosening of nails or clamps, weak form construction, etc., can cause cracks having no particular pattern. Concrete surface distortion is usually the sign of form shifting.



B Subgrade paper rupture or poor subgrade allowing concrete to shift while setting can cause cracking as shown above.

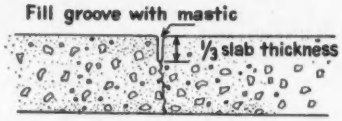


C When concrete settles over obstructions such as reinforcing steel, cracks may occur. This cracking can be prevented by using low-slump concrete and stable subgrade or good footings on good solid ground.

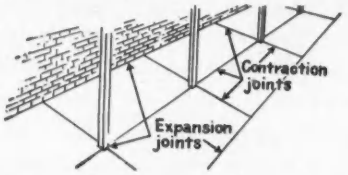
Shrinkage and Expansion

While concrete is plastic or fresh, it occupies its largest volume. When dry, cold and completely carbonated, it has its smallest volume. Varying conditions of moisture, temperature and age between these extremes cause concrete to shrink and expand slightly. Unless provision is made for these normal volume changes, and good concreting rules are observed, cracks may result. Shrinkage during hardening and drying can be greatly reduced by using as little mixing water as possible, dampening the subgrade and forms, and curing the concrete properly.

Shrinkage cracks can be prevented or effectively controlled by contraction and expansion joints, and use of low slump concrete.



D Contraction joints should be placed at points of stress concentration so that in case of shrinkage, cracking will occur neatly beneath the joint as shown in Fig. D. They can be neatly finished so final appearance of the structure is not marred. In sidewalks, place joints at 5′ or 6′ intervals. In driveways, place them at 15′ to 20′ intervals. In large floors, place joints at 15′ to 20′ intervals. In buildings divided into bays by columns, place joints where shown in Fig. E, but seldom over 20′ apart unless adequate steel is used. Cracks in solid concrete walls are minimized by using low slump concrete. Narrow feathering of concrete sections should be avoided to prevent cracking.



E Expansion joints should be placed at junctions of walks with driveways, buildings, curbs, light standards; where a floor joins a column base, stairway, etc., or anywhere else that concrete freedom of movement may be restricted.

Joints cannot be expected to prevent or fully control situations such as:

• Dry subgrade • Drying due to weather immediately after finishing • Carbonation in initial stages of curing • Lack of protection from low humidity atmosphere.

For more information on causes and control of cracking, ask your Alpha representative or write for the Craftsmanship in Concrete folder: "Cracks in Concrete".

ALPHA
PORTLAND CEMENT COMPANY
Alpha Building, Easton, Pa.

National Concrete Contractors Association plans third annual convention and 1960 concrete exposition

Plans for the third annual convention and concrete exposition to be held in the Sheraton Hotel, Philadelphia, on January 28, 29 and 30, were formulated at the Board of Directors meeting of the National Concrete Contractors Association held in Chicago on July 17.

Attending the Board meeting were, seated left to right: Philipp Hoerr, *Peoria, Ill.;* Elbert Lewis, *Greensboro, N. C.;* Jim St. Clair, *Chicago*; Bert Carey, *Chicago*; Roger Corbetta, *New York*; Bill Allen, *Dayton, Ohio*; and standing, left to right: Carl Narducci, *Akron, Ohio*; E. Ray Freeman, *Dallas*; Bob Burns, *Dallas*; H. Bjornson, *Cedar Rapids, Ia.*; Troy Pauli, *Charleston, W. Va.*

In addition to the election of national officers and directors, the convention in Philadelphia will offer technical sessions on subjects of interest to concrete contractors and the concrete industry. The future growth of the industry makes it necessary for all branches to work together in close harmony and cooperation and plans are being made to form committees to establish working concrete industry boards in all principal cities.

paper helps to build

highways and bridges of America

Paper, first used by second-century Chinese as a writing tablet, is helping to build the highways and bridges of America. Research and development have led to wide use of the fibre tube in public construction according to Paul S. Hanway, managing director of the National Fibre Can and Tube Association.

"With the construction of new Federal and State highways reaching an unprecedented peak, more and more builders are using the fibre tube as the quickest and most economical way to form round concrete columns," Mr. Hanway said.

"Basically, the use of fibre tubes in concrete construction reduces the quantity of concrete and reinforcing steel required in bridge building. And the use of the fibre tube in construction is long past the trial-run stage. It has already been used in the construction of the major bridges in the nation."

Within the next 13 years, 70,000 new bridges or spans will be built along the 70,000-mile Interstate Highway System—a ratio of one bridge per mile. Nor does this take into account the thousands of existing bridges which will be modernized or new bridges which will be built on the secondary roads feeding into the Interstate Highway System.

Builders point out that the figures become more realistic when the anticipated population growth is taken into account. According to government experts, the population will rise to about 230 million by 1975. For one thing, this will mean approximately 2.5 million more automobiles annually on the roads of America. Necessarily, there must be a great expansion in the nation's network of roads to relieve the

(continued on page 18)

For letter-perfect concrete

Certainly you can make concrete *without* WRDA and DAREX AEA. But since something of your professional reputation gets poured into every yard you produce, WRDA *and* AEA provide very inexpensive insurance that your good name never will grow less.

Add air to the mix with DAREX AEA and millions of lubricating air bubbles become permanently imbedded in the finished concrete. Controlled air makes the concrete frost-resistant and a whale of a lot more durable. DAREX AEA introduces and controls it.

Reduce water with WRDA and you get a fatter, more uniform mix, with cement particles evenly dispersed and catalyzed throughout. Don't be at all surprised to find compressive strength going up as much as 25 *per cent*. WRDA makes concrete pour better too.

Take our words for it: WRDA and DAREX AEA. Together they mean letter-perfect concrete.

DEWEY AND ALMY
CHEMICAL COMPANY
DIVISION OF W. R. GRACE & CO.
Cambridge 40, Massachusetts
San Leandro, Calif. · Montreal 32, Canada

WRDA

DAREX AEA

expected congested traffic conditions.

Mr. Hanway said that the fibre tubes are used in a variety of column applications, such as underpinning, pier or pile encasement, stub columns and bridge columns. The concrete is simply poured into fibre tubes and allowed to harden. The tube is then stripped away, leaving a cleanly formed concrete column. Thus, structurally strong columns are formed quickly and efficiently. Engineering companies say that the chief benefits derived from fibre tubes are in the savings of time, money, materials and labor.

Fibre forms are also being applied in public construction wherever columns are needed—for schools, hospitals, municipal auditoriums, stadiums and garages. The fibre tube also has a wide use in forming voids in concrete roofs, walls, floors, bridge decks and lift slabs, according to Mr. Hanway. Savings of up to 12 percent are being realized by builders and contractors who are using the fibre tube to form voids in all classifications of public construction. "By displacing concrete at the neutral axis, fibre tubes designed for voiding save reinforcing steel as well as concrete," Mr. Hanway said. "Application of the tubes permits greater freedom of design by eliminating unnecessary weight without reducing structural strength. Another important advantage of using this system is the smooth ceiling formed by the voided slab. The end result is sound engineering at minimum cost."

prestressers to meet at Miami Beach November 1 to 7

The fifth annual convention of the Prestressed Concrete Institute will be held at Miami Beach, Florida, November 1 to 7, according to an announcement by Colonel Martin Korn, executive secretary of the organization. Meetings will be held at the Deauville Hotel. In addition to a full schedule of technical sessions there will be exhibits of materials, supplies and services related to the prestressing industry.

Headquarters for the convention are located at 3132 N. E. 9th Street, Fort Lauderdale, Florida.

Inside wall, to the right, shows decorative stones imbedded in concrete.

native stones decorate concrete tilt-up panels

A giant bird-cage of exposed structural steel and glass panels, combined with 6-inch thick concrete tilt-up panels are among the attractions now luring customers to a new dining room just completed at the world-famed Nut Tree Restaurant at Vacaville, California. Dreyfuss & Blackford were the architects.

The new dining area is contained in a 128- by 47-foot structure which utilizes an exposed steel frame with 6-inch thick concrete tilt-up panels for the sidewalls. These panels form the structural shell of the building while each of the end bays is closed by plate glass framed between mullions of steel tubing.

The general contractor, Continental Construction Company, cast the 21- by 16-foot concrete panels in a rigid frame composed of welded 6-inch steel channels. The frames were laid out on the finished concrete slab floor of the building and were then filled with concrete poured at the job site. When properly cured, the panels were erected along the perimeter of the building. They were fastened with intermittent fillet welds between the channels and the columns.

The panels were poured in a continuous operation, with a special aggregate placed in the top 2 inches of the panels. This aggregate was tan in color and had large selected native rock imbedded in it. The whole slab was brushed, exposed and washed with acid. The finished slab, in place, faces the interior of the building.

The bird cage, which houses thousands of vari-colored tanagers, was carefully integrated into the design of the building. The cage covers a full bay and is completely glass enclosed, with an open passageway connecting the dining areas. The ceiling of the passageway has been covered with exposed steel decking which forms the floor of a glass enclosed flyway connecting the two portions of the cage.

Poured-in-place concrete will be used in further additions to the restaurant planned for completion during the next five years.

SETTING INITIAL 2 SPANS for one of the highway bridges serving Air Force Academy, Colorado Springs. Skidmore, Owings & Merrill, Chicago, architects; A. S. Horner Construction Co., Denver, contractor. L. Boduroff, Denver, consultant for prestressing, trusses, gantries.

120′ girders site-cast in line and rolled into place

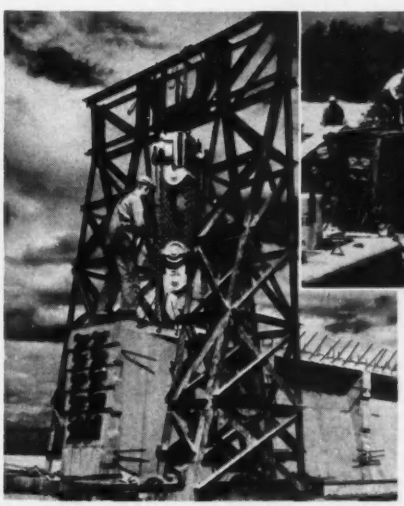
Gantries on temporary trusses handle placement atop 70′ piers

PIER HEIGHTS, on this six-bridge project for the new Air Force Academy at Colorado Springs, ranged up to 70′. That's a tough crane lift to erect big prestressed concrete girders weighing 96½ tons, especially from rough ground.

Instead, the contractor crane-hoisted light temporary trusses, cast the girders in direct line with their final position, and then rolled them into place with 2 gantries riding the trusses. 128 girders were thus placed, 112 of them being 120′ x 6′.

Girders for each bridge were cast behind one of its abutments. When girders reached 4,500 psi cylinder strength, they were prestressed to 700 tons, then moved straight ahead to storage. When girders for 2 spans were completed, the gantries placed them a line at a time, moving the trusses for each line. After concreting the decks, trusses were extended from the second pier and up to 3 additional spans completed the same way.

The ready mixed concrete designed for the girders gave 4% air entrainment, 2″ average slump and a 7-day strength of 6,345 psi. Proper processing and uniformity of the batches delivered to each of the 6 bridge sites were assured by truck mixers of certified design, capacity, mixing speed and water control accuracy.



8 CASTING BEDS back of bridge abutments were in direct line with final girder positions. Space was kept between abutment and casting beds to store one set of girders.

50-TON HOIST HOOKS on gantries handled girders. Girders are 6′ deep, 3′ wide at top flange, a little over 2′ at base, with minimum 8″ web. Note shims holding post-tensioning tendons, each of sixteen ¼″ dia. wires.

news

concrete industry faces major challenge

What has the concrete construction field to offer in comparison with other fields of endeavor to justify any expression of conceit over its accomplishments?

Douglas McHenry, retiring president of the American Concrete Institute and director of development, Portland Cement Association, Skokie, Illinois, in his address before the 55th annual ACI convention in Los Angeles, commented on this question by stating, "It has become a common belief that progress in structural engineering is made very slowly. If we view the centuries that lie behind us, that is true. If we view the decades immediately behind us, it is at the least questionable."

McHenry assured the concrete engineers and builders attending the convention that they need not take a back seat in any discussion devoted to science and technology (excluding perhaps those activities devoted to defense and the military, and to exploring outer space). McHenry pointed out that in comparing the concrete industry with some others, it may be conceded that the industry can set up no single accomplishment against a Boeing 707 nor even against a color television set, but the over-all accomplishment in terms of improving our national welfare through developing a relatively new construction material and new construction techniques is something for justifiable pride.

In referring to achievements in the concrete industry McHenry mentioned such elements as twenty or more types of cement which have been developed for special uses, durability of concrete by entrainment of air bubbles, and special construction techniques which have made possible the most massive structures ever built by man. Further achievements involved the solving of a myriad of problems which had to be dealt with each time this construction material was put to a new use for such things as concrete building units, concrete pipe, concrete linings for tunnels and canals, concrete chimneys, piling, tanks, silos and storage elevators, light

poles, insulating wall panels, thin shells, pavements and hangars for modern aircraft, precast or prestressed structural members, lightweight structural members, radiation shields for nuclear energy, and for such construction techniques as slip-form, lift slab, vacuum treatment, pneumatic application, and design problems dealing with resistance to earthquakes and atomic blasts.

While giving the concrete industry a pat on the back, Mr. McHenry also admonished it to extend its efforts to meet the challenge imposed by the present need for increased, better, and more economical concrete construction.

"Let us forget about progress in absolute terms," said McHenry, "and think in terms of the cost of that progress as a fractional part of the dollar value of our product. We shall have the satisfaction of finding that, in those terms, the last few decades of progress in many other fields have cost 10 to 100 times that which we have paid."

In estimating that the construction industry in 1959 will be a 50 million dollar industry, McHenry asked, "How many of these construction dollars will be plowed back into the industry to improve its products?"

"The answer" said McHenry, "is a small fraction of one percent whereas other industries with technologies no less complex than ours find that to meet the challenge of today requires research and development budgets of 3 to 5 percent, or even 10 percent of gross sales.

"It is a rather well-known fact of life that in this everchanging world, progress is always about proportional to challenge. The rate of progress in our field has never been equalled in the past, but, even so, are we keeping up with the challenge?"

For a number of years, McHenry pointed out, there has been a need to shorten the time lag between the discoveries and the findings of research in engineering and their acceptance and application by designers and builders. In the field of concrete construction, perhaps more than in any other field of engineering, this lag has been shortened some. The speaker expressed the view that complete solution of this problem will come only through leaders of the industry developing a greater awareness of the problem and then pooling their administrative, intellectual, and financial resources to solve it.

books

Manual of Recommended Practice for the Production, Delivery, and Use of Ready Mixed Concrete. *Published by The Concrete Industry Board, Inc., 220 East 42 Street, New York 17, N. Y. 11 pp. $1.00.*

Suggested procedures for facilitating the day-to-day working relationship between the producer and the contractor, architect or engineer are recommended in this non-technical manual which deals largely with business relations of the buyer and seller of concrete. It was compiled from the experiences of all the professions and trades in the concrete construction industry and covers all aspects of concreting, from writing specifications through placement.

The purpose of the manual is to simplify the "purchaser-producer" relationship, making possible efficient ordering and delivery procedures. A better understanding of problems faced by the producer will make it easier for the contractor to order and obtain better deliveries of ready mixed concrete. Also, an appreciation by the producer of the contractor's problems will improve the relationship during and after concrete delivery.

The manual deals with writing of specifications, requesting of quotations, role of the contractor's superintendent, ordering, site preparation, transportation of concrete, and condition of equipment.

The 13-man Committee on Ready Mixed Concrete includes architects, consulting engineers, testing laboratories, contractors and ready mix producers.

Basic Procedures of Soil Sampling. *Published by Acker Drill Co., Inc., P. O. Box 830, Scranton, Pa. 68 pp. Illus. $1.00.*

This non-technical booklet is presented as a source of elementary information on generally accepted field procedures of soil sampling. The book is intended as a simple guide to the builder, architect or construction contractor desiring fundamental soil sampling information. It deals with the techniques of securing samples, and not with subsequent laboratory analysis.

products

For further information use check list on page 31.

curing, sealing, dustproofing

Brochure contains application and test data on Kure-N-Seal, a blend of synthetic rubber resins in fast evaporating solvents. Produces transparent, hard, glossy film to protect floors from abrasion, water, mild acids and alkalies. Applied to freshly laid concrete to promote water retention and complete hydration. BP 1071. L. Sonneborn Sons.

strand chuck

Prestressers who use Supreme strand chucks to end-anchor wire strand will be interested in obtaining a wall chart containing service information. Simple sketches of all phases of use and maintenance of these chucks is included. Supreme Products Corp.

safety signs

Hard hat area signs may be applied instantly by removing backing material for identification of hazardous areas and as reminder to wear hard hats. Eliminate painting and stenciling. Stand out bold and bright to help prevent accidents. Western Lithograph Co.

surface renewer

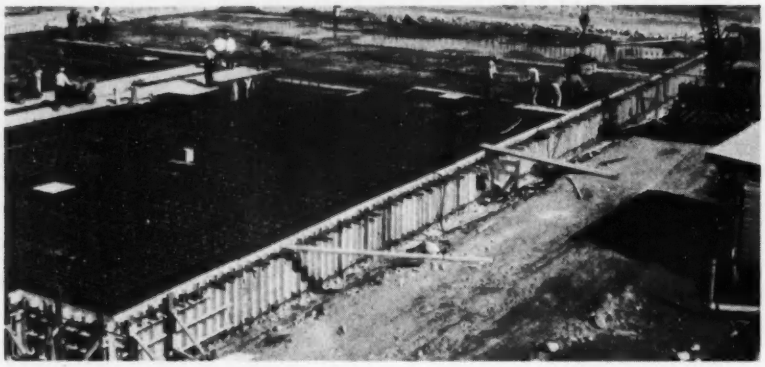
Epoxy compound renews concrete surfaces where high density, resilience, abrasion and chemical resistance are important. Epoxicrete 811 for filling spalled areas has sufficient strength to adhere in thin layers, permitting feather edging. Material is 100 percent solids, retains strength with age and flexibility under extreme weather conditions. Coast Pro-Seal & Mfg. Co.

sealer

Wet basement walls and floors are said to be eliminated by Hydrocure, a combination of liquid latex and vulcanizing powder. Tests show that it is effective as a sealer for swimming pools. Borden Co.

products

For further information use check list on page 31.



no shrinkage cracks

This 120- by 209-foot concrete mat is 5 feet thick with no joints of any kind. It will be the base for generator and boiler of new steam power plant in New Hampshire. Despite size and absence of joints, the structural engineer reports no shrinkage cracks, cold joints or honeycombs in the concrete, and attributes this to use of a moderate cement factor with as little added water as possible; to use of ample reinforcing (500 tons); to even dissipation of heat of hydration by ponding with water. Truck-mixed concrete used for job contained 4 ounces of Plastiment retarding-densifier per sack of cement. This kept mix from hardening during delays in discharging mixers. Upon completion of slab surface was flooded with water for 14 to 20 days. Sika Chemical Corp.

products

For further information use check list on page 31.

concrete check list

Comprehensive check list of factors to be considered when specifying concrete and mortar is included in bulletin X-6. Covers job requirements and conditions, concrete floors, concrete in plastic and hardened state, curing, surface after-treatments, and masonry and grouting mortar. The Master Builders Co.

joint sealer; curing tape

Polysulfide polymer, two-component, cold-applied sealing compound No. 55-Mil, designed specifically for sealing joints in concrete exposed to operational requirements of jet aircraft, and a curing tape, Conseal, to keep joints clean until ready to seal and to prevent moisture loss from newly poured or sawed concrete are described in bulletin PE 5808-10M. Presstite Div., American-Marietta Co.

concrete guns

A line of guns for pneumatic placement of concrete in general construction is described in a catalog. Manufacturer offers special consultation service to provide correct Blastcrete equipment for job requirements. Blastcrete Co.

safety publication

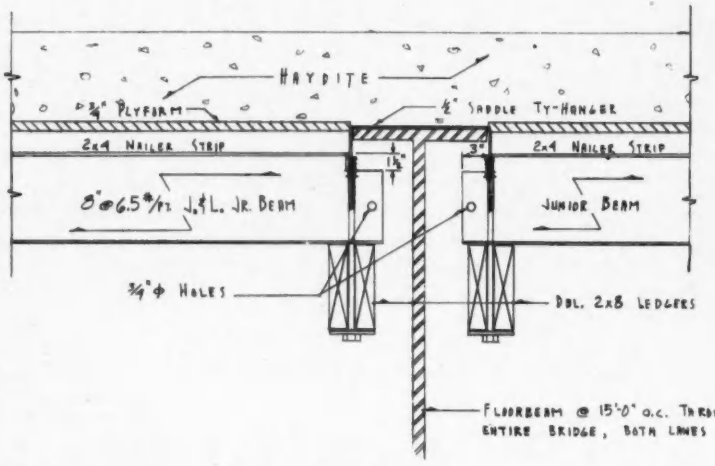
To help the millions of professional drivers who constantly make decisions behind the wheel, the National Safety Council has published a booklet, "A Professional Code for Defensive Driving." National Safety Council.

prestressing tendon

Folder shows pictures and diagrams of tendon placement in forms and how Prescon tendons for prestressed, post-tensioned concrete are coated and wrapped to protect more effectively against corrosion and reduce friction in tensioning. Prescon Corp.

products

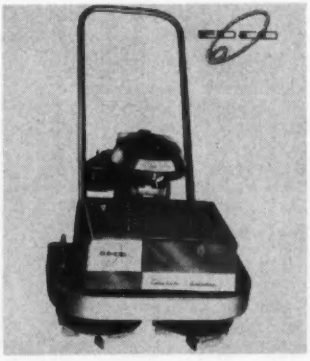
For further information use check list on page 31.



TYPICAL FORMING SECTION @ FLOORBEAMS
SCALE: 1½"=1'-0"

bridge decks

Deck-forming details for viaduct in Kansas City, Kansas, show how Jones & Laughlin Steel Corporation's 8-inch Junior Beams were used in the falsework. J & L supplied 14½-foot lengths which weighed less than 100 pounds and could be handled and placed by two men from top working level of bridge. System was developed by engineers of J. A. Tobin Construction Co. Jones & Laughlin Steel Corp.



concrete floor grinder

Portable concrete floor grinder, light enough for two men to carry, is said to be capable of grinding the roughest slabs in record time. Two large discs, counter rotating for smooth torque-free operation, provide almost 2 square feet of grinding area. Storage compartment allows an extra supply of grinding stones and wedges to be carried in machine. Available in electric and gasoline powered models. Can be used wet or dry. Equipment Development Co.

Dodson's Digest

Good Fortune

When Fred Nichols told me the other day that he'd lost a lot of time this past summer because his concrete was taking too long to set, I saw red!

Fred's been in the road construction business for years, but I just couldn't get him to use Calcium Chloride in his concrete mix.

We went to lunch at his favorite Chinese place a few days ago, and he started telling me all his troubles!

Well, before he could really get warmed up, I excused myself and talked to the chef for a minute without Fred seeing me. When I got back to our table, *I* started right in on *him*.

"Fred, Calcium Chloride in your mix can help solve most of your problems. It'll reduce your initial and final set times by almost *two-thirds*."

Fred's mouth was too full of almond duck to reply, so I kept right on talking.

"And that means a lot with the weather turning colder now. You can extend your season at both ends. You use Calcium Chloride, Fred, and I'll bet you a barrel of turtle soup you'll see more black ink on your books in 1960!"

"Dod," Fred smiled at my enthusiasm, "maybe I'll just try some of that Calcium Chloride."

Just then our waiter brought our coffee—each cup accompanied by one of those Chinese fortune cookies.

Fred grinned when he read his "fortune": "He who uses Calcium Chloride gets good concrete!" That fortune cookie cost me five bucks, but it was worth it. Then I read mine: "He who pays five dollars for fortune cookie should have head examined!"

—L. D. Dodson

P.S.—Find out how Wyandotte Calcium Chloride can help *you* lay better concrete in less time. Send for our folder, "How To Make Better Concrete Products and Ready-Mix." Just drop me a post card for your free copy. *Wyandotte Chemicals Corporation, Wyandotte, Mich. Offices in principal cities.*

products

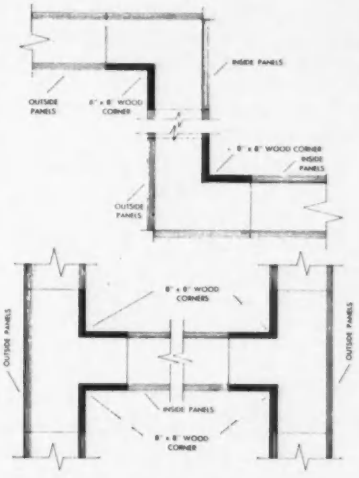
For further information use check list on page 31.

concrete quality control

Three basic tests for concrete quality control—slump, air entrainment, and compression—are illustrated with step-by-step pictures and accompanying explanatory captions. Soiltest, Inc.

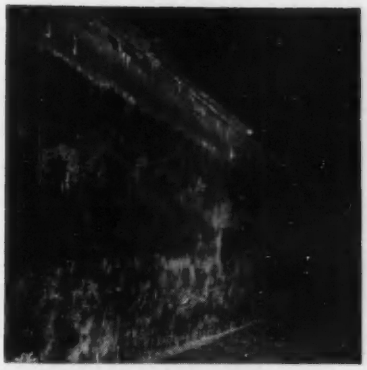
longitudinal float finisher

Bulletin 59156 on Rex longitudinal float finisher outlines advantages of tubular construction including greater unit strength and elimination of sagging, deflection and weaving on forms. Points out how transportability results in time economies and handling ease between jobs. Chain Belt Co.



all-wood inside corner

All-wood corner for concrete forming eliminates loose hardware and cuts on-the-job assembly time. Unit made of same 1⅛-inch plastic-impregnated plywood as regular Simplex panels and fitted with ¼- by 2-inch welded steel braces for maximum strength. Corner is light in weight and easy to set, strip and move. Designed with retractable levers and hooks at each end. This enables corner to serve as both regular inside or opposite corner and permits use with either inside or outside panels. Also replaces double hook and double level panels on cross-walls and similar jobs. Simplex Forms System, Inc.



Reservoir walls before BERYLEX coating, showing evidence of many previous repairs. Reservoir had leaked for 37 years.

products

For further information use check list on page 31.

concrete additive

Folder gives detailed answers to questions concerning Berylex cementing compound. Covers effect on ultimate strength, high early strength, dusting, wear and acid resistant concrete surfaces, colored concrete, and concrete for tilt-up work. 206-QA. Berylex National Sales Div. of Harry Warde & Co.

wire rope

Bulletin 107 provides specific recommendations for the best wire rope construction to use on all types of equipment. In many cases, two or three choices are provided to meet special circumstances under which equipment is working. H. K. Porter Co., Leschen Wire Rope Div.

tractor catalog

Catalog L-1074 describes and pictures Eimco series 105 tractors and tractor units which are claimed to be engineered to the job and outstanding as to performance and low-cost maintenance. Pictures in color and full specification sheets are included. Eimco Corp.

calcium chloride

Concrete users will be interested in the revised third edition of manual CM-1, "Calcium Chloride in Concrete." Provides ready reference to quantitative data and includes nearly 20 charts and 40 illustrations which refer to the various benefits of calcium chloride as it is used in modern concrete construction. Calcium Chloride Institute.

bonding agent

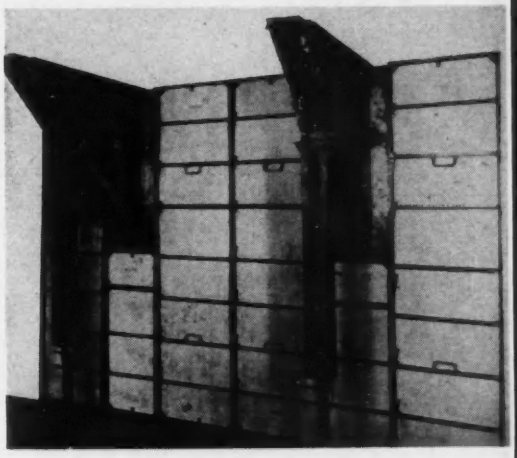
Fluid, two-part, modified epoxy compound can be mixed easily and applied by brush, roller or spray to damp or dry concrete, to bond new concrete to cured concrete, or old concrete to old concrete. Also bonds concrete to other structural materials. Products Research Co.

Check boxes below and on next page for information on products described in this issue

See mailing instructions on next page.

☐ **coupler**

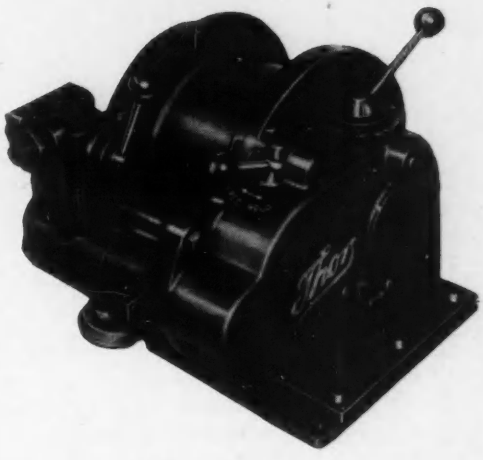
Straight through flow Kamlock quick coupler is designed specifically for use with pneumatically unloaded box cars or air trucks. Cement or other powdered or granular material, commonly shipped in bulk and unloaded pneumatically to save time, flows through freely without build up since there are no recesses to catch on. Straight through flow greatly increases the Kamlok's life by stopping the damaging erosive effects of rapidly moving cement or other granular material. OPW-Jordan.



☐ **stoop prefab form**

Steel wing wall or stoop prefab form is designed both for residential and industrial construction where wing walls are required. It is triangular in shape and will form a concrete bracket 4 feet deep, extending 4 feet from wall at top. Bracket is 8 inches thick at wall, tapering to 6 inches at outer extremity. Symons Clamp & Mfg. Co.

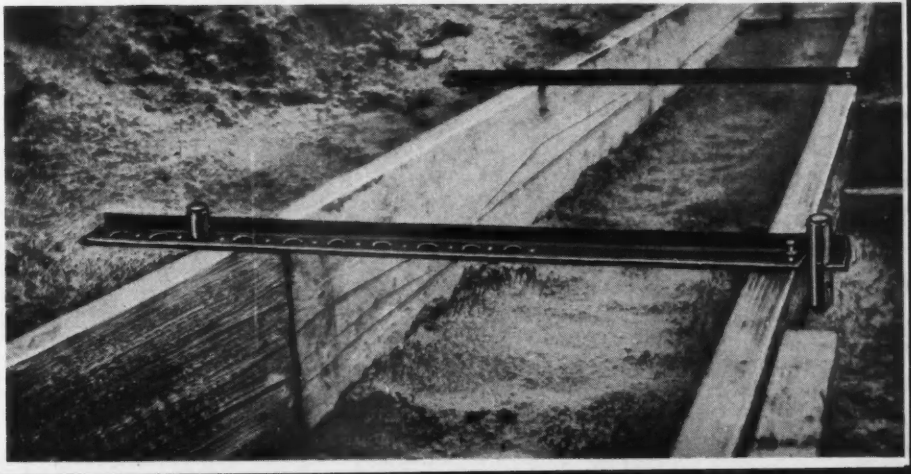
☐ **tugger hoist**



Air-operated, 1500-pound capacity tugger hoist with dual control system is designed to lift, lower, and hold loads by air power or permit free-wheeling lowering of unloaded rope. It is built for operation at floor level and has wire-rope capacity of 280 feet. Throttle control is furnished standard mounted on hoist, but can be removed and operated from a remote position by means of connecting hoses. Safety features: "Dead-man" power throttle, dynamic brake for controlling free-wheeling, and mechanical load-holding lock. Tool has been field tested in construction operations. Thor Power Tool Co.

☐ **combination spreader bar and top iron**

This combination unit has 10 stake holes in one end, spaced 2 inches o.c. and a U section on the other end for locating the form boards on the opposite side. As a spreader bar it provides for concrete thicknesses from 6 to 24 inches. Nail holes, placed between stake holes, provide a top iron which braces the forms and often eliminates the need for top row of ties. It requires no clean-up or maintenance and can be re-used indefinitely. Used in combination with nail-type steel construction stakes it is said to assure the most accurate and lowest cost forming for footers, low walls, curbs and gutters. Dee Concrete Accessories Co.



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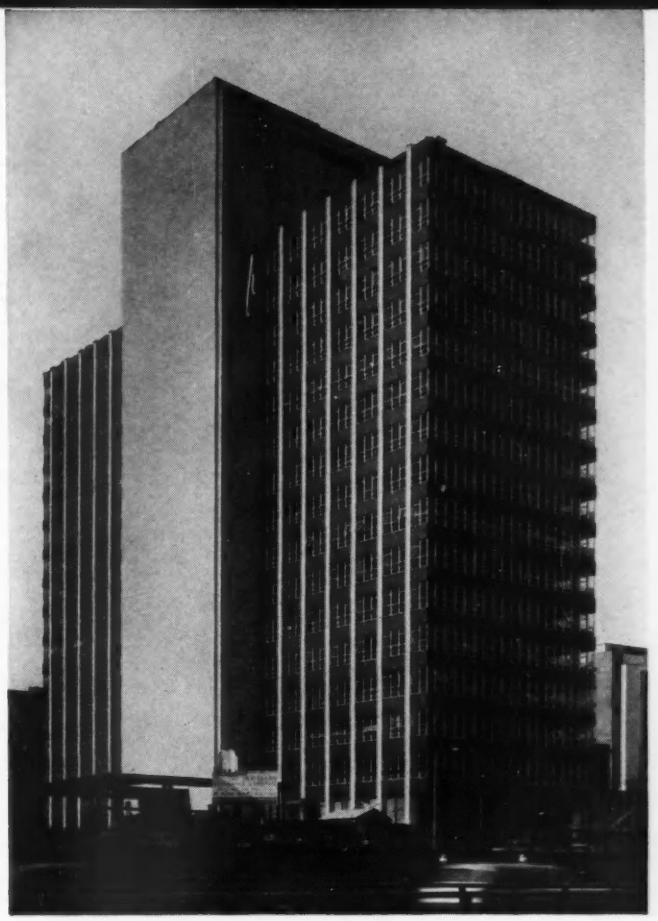

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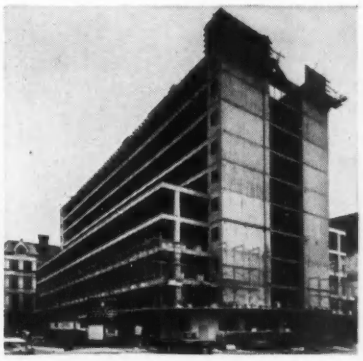

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